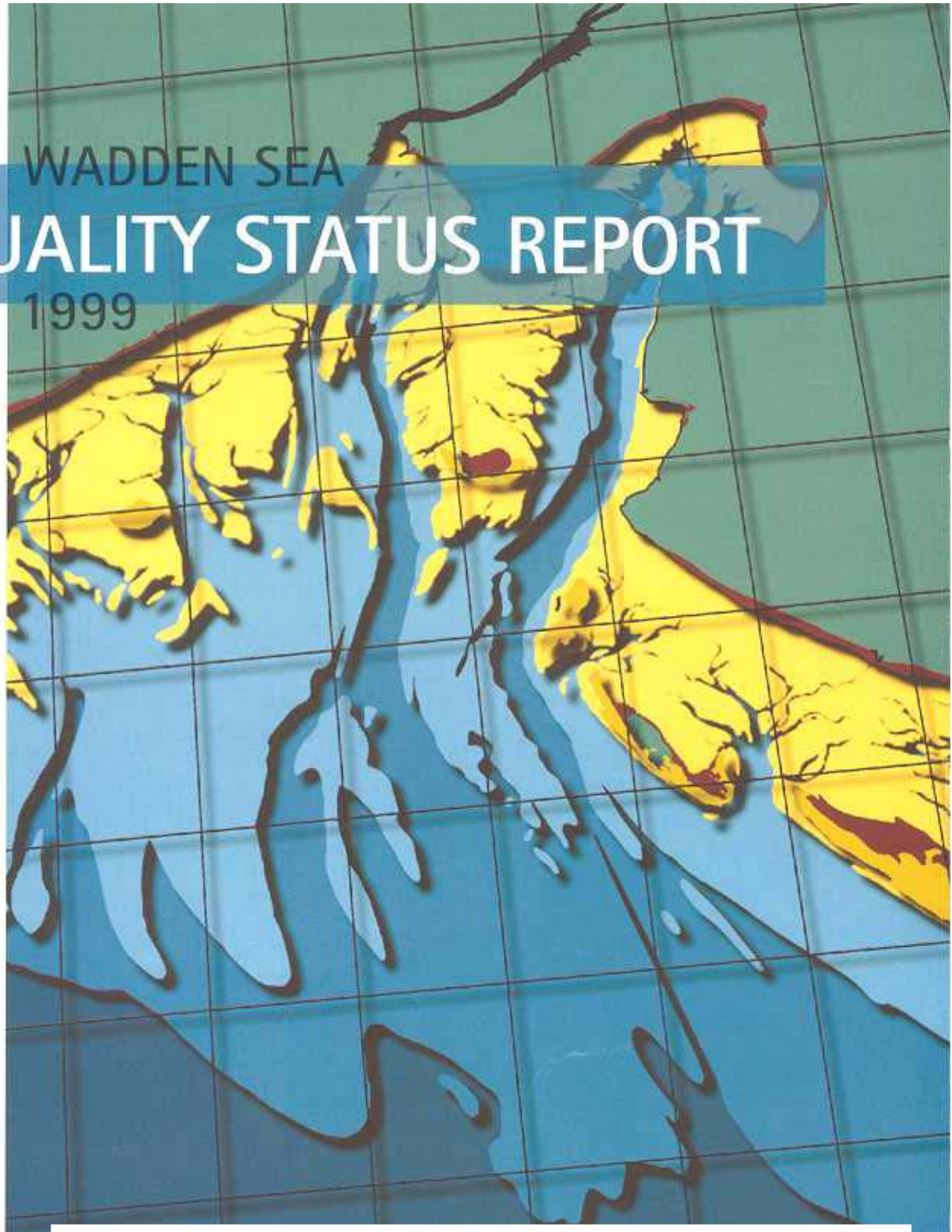

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5.9 Oyster Beds and *Sabellaria* reefs

S. Nehring

5.9.1 Introduction

Oyster beds and sabellarian reefs were regarded by Hagmeier and Kändler (1927) as the most characteristic features of the tidal channels in the Wadden Sea. Both biotope types provided secondary habitats to numerous species. Re-investigations in the 1980s revealed the loss of reefs and beds and a decline of their associated fauna.

Surprisingly over the last few years, a 're-colonization' of oysters and *Sabellaria* could be observed in the Wadden Sea. With respect to these long-term phenomena and their ecological significance, an actual assessment of the historic, and recent, status of both biotope types is presented.

5.9.2 Historic and current status of oyster beds

In historic times, beds of the native oyster *Ostrea edulis* were of wide-spread occurrence in the Wadden Sea from low tide level down to about –6 m (*e.g.* Hagmeier and Kändler, 1927; Linke, 1937). Presumably, the last living individuals were found in 1940 (Hagmeier, 1941). After that, *O. edulis* was thought to be extinct in the region. There has been some debate about the actual cause of the decline (Möbius, 1877; Hagmeier and Kändler, 1927) but more recent accounts on the subject leave little doubt that overexploitation by oyster fishery exterminated these populations (Reise, 1982; Neudecker, 1990).

However, in 1992, a small number of living *O. edulis* had been found again in the German part of the Wadden Sea. Some lived on the edge of littoral mussel beds near the island of Sylt, others were dredged from the shallow sublittoral (Reise, 1998b). Whether this tiny population will re-establish oyster beds is uncertain because the sites of the former *O. edulis* banks are nowadays occupied by blue mussel (*Mytilus edulis*) cultures.

Over the last 100 years, the Wadden Sea and its estuaries have been invaded by numerous alien macrozoobenthic species (see Nehring and Leuchs, 1999), of which some, such as the bivalve *Ensis americanus* and the polychaete *Marenzelleria* cf. *wireni*, have even become dominant (see also 5.15: Estuaries and 5.7: Macrozoobenthos). A significant example of population 'enrichment' is the Pacific oyster (*Crassostrea gigas*) introduced in 1965 into the Dutch Oosterschelde estuary and in 1986 at Sylt for cultivation (Reise, 1998b).

Since the beginning of the 1980s, wild *C. gigas* has been reported in the Wadden Sea by Bruins (1983), who found it attached to stones at Texel. It was assumed that transport with seed mussels from the Oosterschelde was the most likely distribution factor. Since this record, individuals of *C. gigas* have been regularly found in the Dutch Wadden Sea but not in high abundance (Reise, 1998b). In the past few years, specimens that had gone wild from the local culture plot at Sylt have been found living in increasing abundance in the German North Frisian area in eulittoral wild banks of *Mytilus edulis* as squatters (Reise, 1998b). In 1998, a first living individual was observed in the East Frisian region as well (Reise, pers. comm.), which may have been dispersed from The Netherlands by natural means. This alien species appears to be more ecologically potent, *i.e.* more adaptive, than its local predecessor *O. edulis* (Reise, 1998b). The recently expanding occurrence of *C. gigas* in the German Wadden Sea (Figure 5.10) makes it likely that the oyster beds, together with their associated community of organisms, will re-establish, at least in the tidal zone (Nehring, 1998).

5.9.3 Historic and current status of *Sabellaria* reefs

The polychaete *Sabellaria spinulosa* requires suspended sand grains to build its tubes. Reef communities, therefore, only occur in very dynamic areas where sand is placed into suspension by water movement. A single reef can extend over several hectares. It was shown that the closely related *S. alveolata* can reach an age of three years, in individual cases of ten years (Wilson, 1971). The development of a reef starts with the settlement of larvae on adequate habitat structures, *e.g.* shells (especially oyster valves), gravel, stones or rocks. Already existing sabellarian reefs (dead or living) are a preferred settling ground as well. The reefs contain a more diverse fauna than nearby areas with low or no *S. spinulosa* (more than twice as many species and almost three times as many individuals, according to Jones, 1998). In former times, extensive reefs of Sabellaria occurred frequently in the German Wadden Sea. The reefs were a common sublittoral structure along the slopes of the northern tidal inlets (Hagmeier and Kändler, 1927). In the East Frisian area, some eulittoral reefs were reported from stone fills at islands (Linke, 1951). Sublittoral reefs were described here, mainly from the Jade (Schuster 1952). Reefs have neither been reported from the Danish nor from the Dutch Wadden Sea.

In the middle of the 1920s, a net decrease of sabellarian reefs along the German North Sea

coast started. Today, only three living reefs have remained, two in the sublittoral of the Jade, the third south of the island Sylt (Fig. 5.10) (Vorberg, 1997). However, since 1993, no new observation of the living reef nearby Sylt exists. In the Jade, since 1996, only a lot of compact lumps of empty tubes have been found in dredge campaigns at the living reef positions carried out within the framework of the BfG estuary monitoring program (Nehring, unpubl.). In the 1980s, additionally, at two other locations in the Jade (near the island Mellum and opposite Wilhelmshaven) living reefs had been recorded, only empty tubes were found by the BfG monitoring in the last few years (Fig. 5.10. Because a high number of fresh looking tube lumps had been found, it cannot be excluded that still several undetected living reefs occur in the Wadden Sea.

It was shown that *S. spinulosa* larvae are strongly stimulated to metamorphose and settle by cement excretions of adult or newly settled young *Sabellaria* (Jones, 1998). The larvae are also able to detect, biochemically, old worm tubes which have been built by the same species (Vorberg, 1995). Therefore, several potential settling grounds for a spontaneous regeneration of this characteristic type of Wadden Sea biotope exist. Conservation management must, therefore, be directed towards protection of both living and dead reefs.

Studies in relation to sewage and other pollution suggest that *S. spinulosa* is not particularly sensitive to changes in water quality (after Jones, 1998). Riesen and Reise (1982) were the first to put forward the hypothesis that the bottom trawls of the shrimp vessels had destroyed the sublittoral reefs mechanically. The main operation area of the shrimp fishery in the Wadden Sea was, and is, alongside the slopes of the tidal channels. Total landings of the shrimp fishery have fluctuated but have not increased since the 1920s. The size of the fleet has declined but, on the other hand, fishing gear has become larger and more efficient (Reise *et al.*,1989). The extinction of reefs by net catch (see Vorberg, 1997) is a plausible second important factor in the observed decline. Furthermore, increased areas of blue mussel farming in sublittoral areas of the Wadden Sea have made some littoral benthic communities rare, amongst which *Sabellaria*, the hydroid *Sertularia* and the sponge *Halichondria* (see also section 5.8, Blue Mussel). Vorberg (1995, 1997) also discussed the negative influence of changes in the hydrological regime due to coastal engineering (mainly dike and dam building) on the development of sabellarian reefs. Undoubtedly, mussel farming and large scale construction have had negative consequences for the number of reefs but it may be assumed that the permanent direct physical disturbance by shrimp fisheries prevented a better natural reef development up till now. On the suggestion of Buhs and Reise (1997) to obtain more direct evidence, selected tidal channels should be closed to the exploitation of living resources and those left open may serve as controls.

5.9.4 Recommendations

- Monitoring of the introduced oyster *Crassostrea gigas* is necessary to check effects on the native biota.
- Nature conservation should aim at protecting both living and dead sabellarian reefs. To this end, the establishment of undisturbed sublittoral areas along the slopes of selected tidal channels is necessary.
- Monitoring should, primarily, be carried out in areas where sabellarian reefs have recently been observed, so as to get more information about the population dynamics of *Sabellaria*.

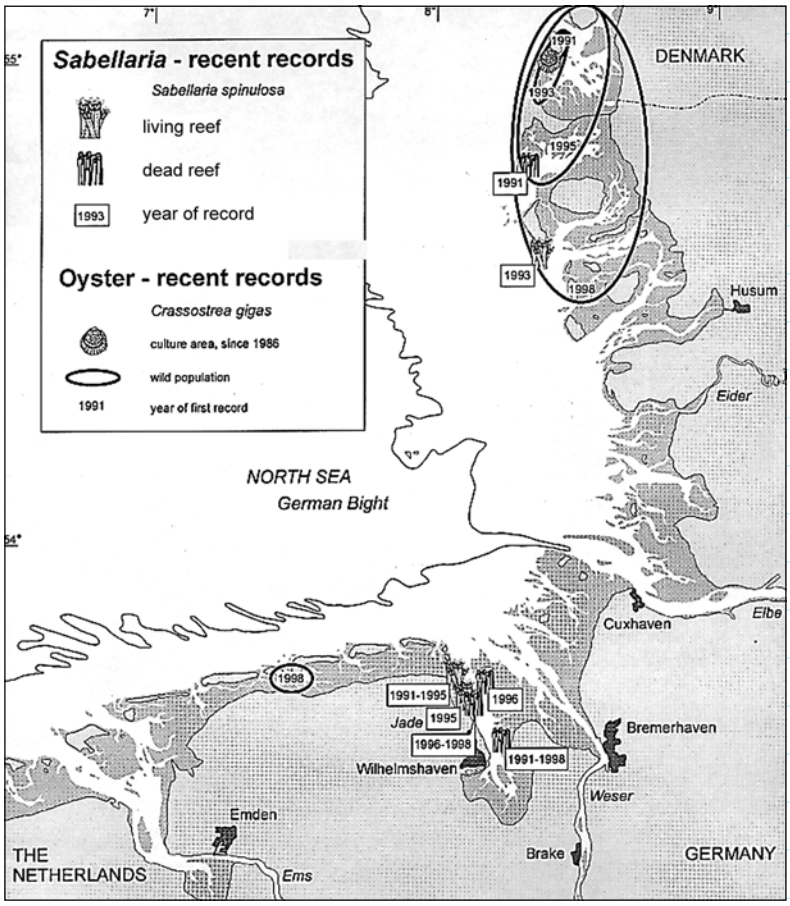

Figure 5.10. Recent records of the Pacific oyster *Crassostrea gigas* and the polychaete *Sabellaria spinulosa* in the Wadden Sea. Based on data from Vorberg (1997), Nehring and Leuchs (1998), Reise (1998b, pers. comm.) and Nehring (unpubl.).

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